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(54) Attachment method for a hinge

(57) A method of pivotally connecting two articles such as a door 12 and the cover 14 of a circuit breaker distribution board comprises providing a polypropylene hinge 16 having hinge plate portions 42 and 46 connected by a flexible hinge region 50. The hinge plates are secured to the two articles by means of integral bosses 52 to 58 which extend through apertures in the articles and are thermally deformed to prevent withdrawal.

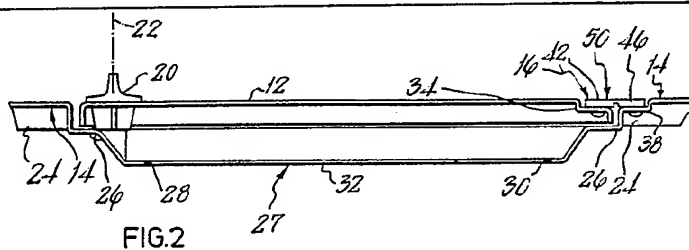


FIG. 2

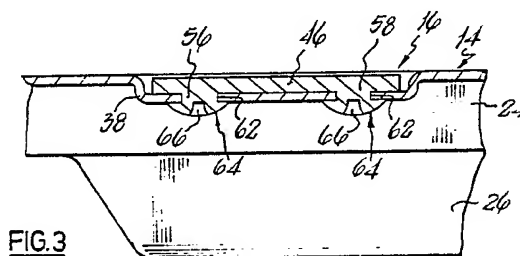


FIG. 3

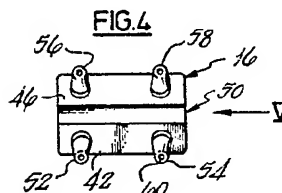
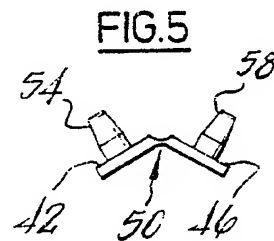
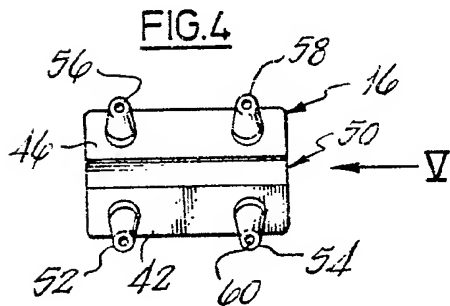
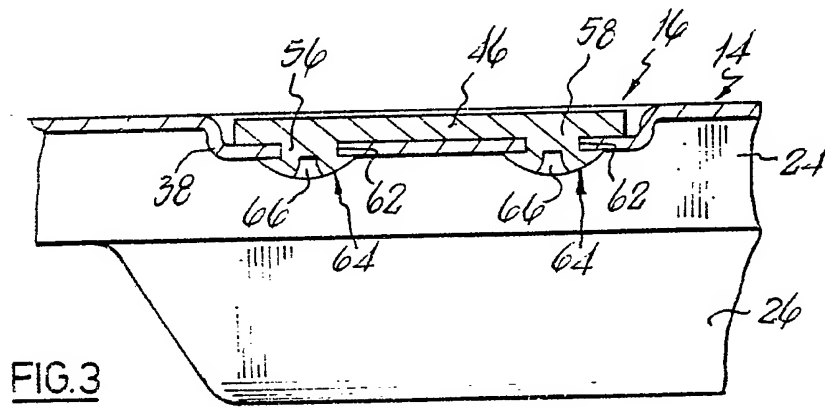
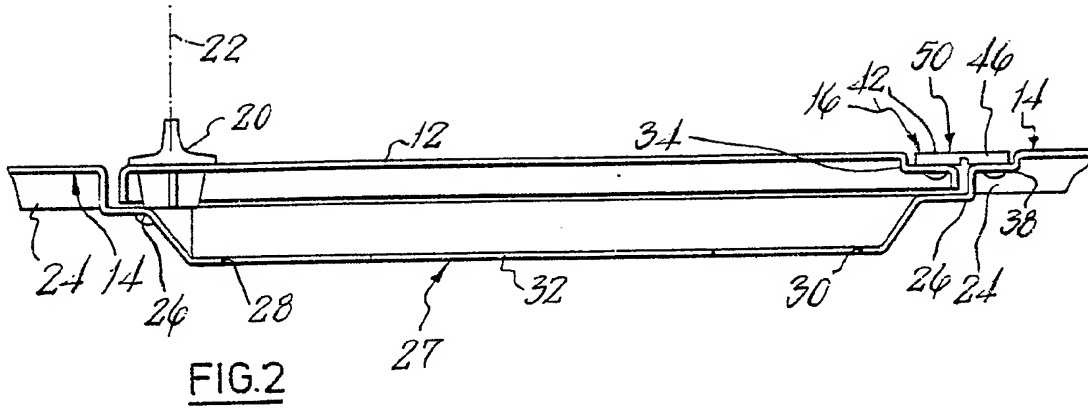


FIG. 4

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SPECIFICATION

Attachment method

5 This invention relates to an attachment method, and to an article having a further article attached thereto by the method, and to an article adapted for use in the method.

The attachment method of the invention is applicable to the attachment of articles one to the other, in general, but is applicable particularly but not exclusively to the attachment of mechanical components to each other. A particular application of the invention is the attachment of a hinge to two components between which angular movement is to occur – such as the door of the cover of a circuit breaker distribution board, and lids for such articles as washing machines and spin dryers.

Problems that arise from the use of conventional attachment methods (such as steel rivets and the like) in articles of the kind mentioned in the preceding paragraph include damage to the paintwork of the article arising from the inherent nature of the attachment method, and the consequential disadvantages of the need to re-finish the paintwork later, and the likelihood of corrosion during subsequent use of the article. Additional disadvantages applicable to conventional attachment methods include their cost and, in some cases, relatively complex nature.

An object of the present invention is to provide an attachment method offering improvements in relation to one or more of the disadvantages of conventional attachment methods – as identified above.

35 According to the invention there is provided a method of attaching articles one to the other comprising providing a polymeric fastener element attached to one article, causing said fastener element to extend through an opening in the other article, and providing means whereby withdrawal of said fastener element from said opening is inhibited.

Preferably said fastener element is formed integrally with said one article. The fastener element may be formed as a boss on said one article. Preferably at least two fastener elements are provided on said one article.

A further preferred feature of the invention is that the fastener element is formed of a thermoplastic polymeric material, whereby withdrawal of the fastener element from said opening can be inhibited by thermal treatment and deformation thereof.

Alternatively, withdrawal of the fastener element from said opening may be inhibited by means of a retaining element engageable with the fastener element. The retaining element may for example be in the form of a spring clip.

In the case where withdrawal of the fastener element is inhibited by deformation of the fastener element, this may be achieved by application to the fastener element of a heated tool or by means of the application to the fastener element of ultrasonic energy – i.e. by a staking process. Alternatively,

mechanical deformation of the fastener element may be achieved by, for example, spin-forming the fastener element.

65 Preferably also, said one article to be attached comprises a hinge formed predominantly of polymeric material and having a flexible hinge region extending between opposite sides of the article, and at least one fastener element being formed in the polymeric material on each side of said hinge region.

70 The invention also provides an article having another article attached thereto by a method as defined in the preceding paragraphs. According to a further aspect of the invention there is provided an article having a projecting fastener element suitable for use in a method as defined in the preceding paragraphs. Preferably said article is in the form of a hinge of polymeric material. The invention also provides an assembly comprising at least two articles secured together by said hinge so as to be angularly movable relative to each other.

80 An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a front elevation view of a door assembly having two hinges incorporating fastener elements whereby the hinges are secured to the door and to the surrounding support structure;

90 Figure 2 shows a section on the line II-II in Figure 1 through one of the hinges and the associated door structure;

Figure 3 shows, on a larger scale a section on the line III-III in Figure 1 through one side of the hinge and the associated support structure to which it is secured;

Figure 4 shows a perspective view from one side, of a hinge incorporating integral fastener elements whereby the hinge may be secured, for example, to the structures shown in Figures 1, 2 and 3, the hinge being shown in its unattached condition prior to deformation of the fastener elements thereof; and

Figure 5 shows an end view of the hinge of Figure 4, the direction of viewing being indicated by arrow V in Figure 4.

As shown in Figure 1 a door assembly 10 comprises a door 12 in the cover 14 of a circuit breaker distribution board (not shown). Cover 14 constitutes a support structure for door 12. Door 12 is secured to cover 14 by means of a pair of spaced hinges 16, 18. A manually turnable latch member 20 is provided at the free edge of door 12 for engagement with the adjacent fixed edge of cover 14 so that the door can be selectively secured to and released from the cover for opening purposes by turning the latch member about an axis 22 extending at right angles to door 12.

As shown in Figure 2, cover 14 is formed with an edge flange 24 (not seen in Figure 1). The cover is also provided with an inwardly-recessed or dished portion 26 in which door 12 is received, the dished portion having an aperture 27 defined by side edges 28 and 30 and end edges 32.

The structure of hinge 16 is substantially identical to hinge 18 therefore only one of these will be described in detail. Door 12 and cover 14 are each provided with pairs of shallow inwardly-dished portions 34, 36 and 38, 40 respectively to receive the plate portions 42, 44 and 46, 48 of the hinges 16 and 18 respectively, whereby the outer surfaces of the plate portions are flush with the outer surfaces of door 12 and cover 14, as shown in Figures 2 and 3.

Hinges 16 and 18 are both formed of thermoplastic polypropylene. As shown in Figure 4, hinge 16 comprises plate portions 42 and 46 which are relatively thick, the plate portions being linked by a relatively thin hinge region 50 where flexing occurs in use. The plate portions and the hinge portion are formed as an integral structure in the polymeric material.

Two pairs of fastener elements 52, 54 and 56, 58 are provided on plate portions 42 and 46 respectively. The fastener elements are attached to their respective plate portions and indeed are formed integrally therewith in the thermoplastic polymeric material.

The fastener elements 52, 54, 56 and 58 are in the form of bosses of generally cylindrical form and each having a slightly tapering (i.e. frusto-conical) outer portion for ease of insertion into an aperture in a component to which the hinge is to be fastened. Each fastener element has an end aperture 60 extending into the fastener element lengthwise thereof from the outer end of the fastener element – in the un-deformed condition of the fastener element as shown in Figure 4.

Plate portions 42, 44, 46 and 48 are, due to their greater thickness, relatively inflexible, whereas hinge region 50, due to its relatively thin form is correspondingly flexible and provides the hinge action for the hinge as a whole. The nature of the polymeric material is such that it can undergo very many flexing operations in hinge region 50 (i.e. opening and closing of door 12) before breakdown or damage of the hinge occurs, in normal usage.

In the method of attaching articles one to another according to the invention, fastener elements 52 to 58 which are attached to one article (constituted by hinge plate portions 42 to 48) are inserted through opening 62 provided in another article (door 12 and/or cover 14), and means is provided whereby withdrawal of the fastener elements from the opening 62 is inhibited.

The openings 62 are provided both in door 12 and in cover 14, in the dished portions 34 to 40 thereof, at spacings such as to receive the fastener elements. In the drawings, openings 62 are shown in Figure 3.

Withdrawal of the fastener elements from openings 62 is inhibited (and indeed prevented) by deformation of the fastener elements by the application thereto of a heated tool whereby the fastener elements are effectively peened-over so as to have the generally domed form 64 with a central opening 66 whereby the hinge 16 is firmly secured in dished portions 34 and 38.

Advantages provided by the embodiment of the invention described above include the low cost and simplicity and ease of attachment of the hinges 16 and 18. Moreover, the hinges are attached to the

door 12 and the cover 14 without damage to the paintwork thereon – since the only operations required are insertion of the fastener elements 52 to 58 into openings 62 and the application of a heated tool to the free ends of the fastener elements. Accordingly, there is no need to provide a further finishing stage for the paintwork around the hinge (as is needed with previously known mechanical attachment methods). Additionally, since the paintwork is not damaged, corrosion of the metal structures around the hinges is much less prone to occur during the life of the structure.

Among modifications which could be made in the above-described embodiment without departing from the scope of the invention are the use of a retaining element such as a spring clip to inhibit withdrawal of the fastener elements from their associated apertures. Such a retaining element would be inserted into the fastener elements whether by application of heat or otherwise. Instead of using a heated tool to deform or distort fastener elements, this may be achieved by the application thereto of ultrasonic energy i.e. by staking, or by mechanical deformation such as by spin-forming.

The invention is applicable in general to the fastening of articles one to the other, particularly to the securing of articles to painted metal structures such as in domestic hardware such as washing machines and spin driers and the like.

In the above embodiment of the invention the polymeric material is polypropylene. However, the invention is not restricted to polypropylene and other polymers may be employed according to the usage involved. In the case where the polymeric fastener element is attached to or formed integrally with a hinge assembly, then polypropylene is believed to be the best material currently available. Other polymers or mixtures of polymers may be developed which have improved characteristics for the purpose of the invention, or for particular applications thereof. All such polymers are intended to fall within the scope of the invention. Furthermore, polymeric materials used in the invention may have incorporated therein fillers, reinforcements, and/or extenders if desired, according to the usage of the particular article involved.

CLAIMS (filed 27 May 1982)

1. A method of pivotally connecting two articles comprising providing a polymeric hinge having an integral assembly of two hinge plate portions connected by a flexible hinge region, the method including the step of applying securing means to said hinge to secure said hinge plates one to each of said articles.

2. A method according to claim 1 comprising the step of causing polymeric fastener elements to secure said hinge plates to said articles.

3. A method according to claim 2 wherein said polymeric fastener elements are formed integrally with said hinge plates.

4. A method according to claim 3 wherein said polymeric fastener elements are formed as bosses on said hinge plates.

5. A method according to any one of claims 2 to 4 wherein said polymeric fastener elements comprise

a thermoplastic polymeric material, and the step of applying securing means to said hinge comprises thermally deforming said fastener elements.

5 6. A method of pivotally connecting two articles substantially as described herein with reference to the accompanying drawings.

10 7. A hinge in the form of an integral assembly comprising polymeric material having two hinge plate portions connected by a flexible hinge region and means to secure said hinge plates one to each of two articles to be pivotally connected.

8. A hinge according to claim 7 comprising polymeric fastener elements to secure said hinge plates to articles to be joined.

15 9. A hinge according to claim 8 wherein said polymeric fastener elements are formed as bosses on said hinge plates.

20 10. A hinge according to any one of claims 7 to 9 wherein said polymeric fastener elements comprise a thermoplastic material for thermal deformation after assembly with articles to be connected.

11. A hinge comprising polymeric material substantially as described herein and as illustrated in any of the accompanying drawings.

25 12. An assembly comprising two articles to be pivotally connected, in combination with a hinge according to any one of claims 7 to 11.

30 13. An assembly according to claim 12 wherein at least one of said articles to be connected is formed with apertures to receive polymeric fastener elements.

14. An assembly according to claim 12 or claim 13 wherein at least one of said articles comprises a painted metal structure.

35 15. An assembly according to claim 14 wherein said assembly comprises a cover for a circuit breaker distribution board and an associated door.

40 16. An assembly according to claim 15 substantially as described herein with reference to the accompanying drawings.